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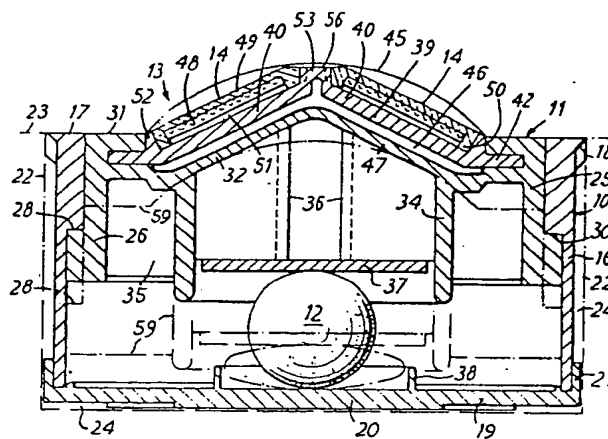
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54 **Reflective road markers.**

57 A road marker for embedding in a road surface (23) has a displaceable reflector unit (11) resiliently carried in a cup-shaped casing (10) on a spherical rubber spring (12). The reflector unit (11) carries uppermost a pair of oppositely-facing reflective elements (14) disposed back-to-back and inclined at low angles to the horizontal. The reflective elements (14), in the upper biased position of the reflector unit (11), protrude above the upper rim (17) of the casing (10). A pair of guard shoulders (45) disposed on the reflector unit (11) flank the pair of reflective elements (14), and protrude above adjacent parts of those elements (14), so that when a vehicle tyre rolls over the marker, depression of the shoulders (45) by the tyre displaces the reflective elements (14) away from the tyre and thereby reduces the extent or degree of physical contact of the tyre with the exposed surfaces of the reflective elements (14). The shoulders (45) preferably incorporate metal reinforcement members to protect the shoulders (45) against non-rolling objects which slide over the marker, and the reflector unit (11) has apertures through which jets of air/water are expelled from the casing (10) when the reflector unit (11) is depressed by a tyre.



Reflective Road Markers.

This invention relates to reflective road markers, of the kind comprising an outer casing embedded, or to be embedded, in the surface of a roadway, a reflector unit, and resilient mounting means mounting the reflector unit in the outer casing, the reflector unit having an upstanding or protruding portion furnished with at least one reflective surface, normally lying above the road surface, and the reflector unit being movable up and down in the casing so that a vehicle tyre passing over the marker can depress the reflector unit against the resilient mounting means. Such a road marker will be called in this description "a road marker of the kind hereinbefore specified".

In the United Kingdom Patent Specification No. 1507385, in the name of Mendel King and Ray Limited, there has been described and claimed such a road marker in a form designed to be cheaply produced and installed, and to be robust and long lasting in use. The marker described in that specification has a cylindrical outer casing embedded in the road surface, and the resilient mounting means consists of a synthetic rubber ball. The

reflector unit comprises a reflector casing made of translucent material. The reflector casing is hermetically sealed and encloses within it one or more reflector elements, each of which has a surface arranged against or integral with an inner face of the reflector casing. As described in the aforementioned specification, the reflector elements are arranged vertically, so that the upstanding portion of the reflector unit is like a tombstone. The "tombstone" is cleaned by means of a thin web of material integral with the outer casing, which wipes the outer vertical surfaces of the upstanding portion of the reflector unit as the latter is depressed by a vehicle tyre, and again as it rises under the influence of the synthetic rubber ball when the tyre has passed on.

An important requirement for anything fixed in a road surface is that it shall be capable of withstanding severe impact forces when run over by heavy vehicles. In the case of a reflective road marker having its reflective portion standing proud of the road surface, this upstanding portion must of course itself be mechanically strong. Since, however, it is not usually necessary for the full weight transmitted to the road surface by a vehicle wheel to be applied to the reflector unit of the marker in order to depress the latter, it has sometimes been the practice to provide fixed, upstanding guard shoulders at either side of the marker, to take some of the load imposed by a vehicle on the marker. The aforementioned Patent

Specification No. 1507385 describes such shoulders, optionally provided and formed as part of the fixed outer casing of the road marker.

Whilst, for the reason given above, the provision  
5 of guard shoulders is desirable, it is to be remembered that there may be any one or more of three reasons why the reflector unit of a road marker is made depressible in the first place. The first reason is that, in certain types of marker, cleaning of the exposed light-receiving or  
10 light-transmitting surfaces of the reflector is effected by wiping those surfaces, and this depends in most cases on the surfaces being depressed past a suitable wiping element. An example is the marker described in the said Patent Specification No. 1507385. The second reason for  
15 making the reflector unit depressible is to lessen the likelihood of damage to the marker itself by the vehicles passing over it. The third reason is that, since anything protruding above the road surface will to some extent upset the smooth passage of a vehicle by creating a bumpy  
20 ride, it is desirable to reduce this unpleasant effect by allowing the protruding object to sink temporarily as the vehicle passes over it.

Fixed guard shoulders help to enhance the lessening of damage to the road marker. They are, however,  
25 themselves highly susceptible to damage and must therefore be made particularly robust. Furthermore, being fixed, they remove much of the advantage of a reduction in smooth

riding which would otherwise be afforded by the fact that the reflector unit is depressible.

5 In a road marker according to the present invention in one aspect, the reflector unit includes a pair of guard shoulders flanking the reflective surface or surfaces and forming part of the said upstanding portion; thus when a vehicle tyre passes over the marker, the shoulders are depressed also. The guard shoulders preferably extend to a height at least as great as that of the reflective  
10 surfaces.

It will be appreciated that, whereas in a road marker as described in the said patent specification without fixed guard shoulders, a vehicle tyre can depress below the road surface the only part of the marker (namely  
15 the "tombstone") normally standing proud of the road surface, this is not the case in the versions of that marker which do have fixed shoulders. The provision of guard shoulders on the depressible reflector unit (instead of on the fixed outer casing) according to the present  
20 invention, allows all parts of the marker normally standing proud of the road to be depressed below or substantially flush with the road surface.

The road marker of this invention may be made in any suitable material, but can conveniently be made in the  
25 form of an assembly of injection-moulded plastics components. The reflector unit of such a marker has a body consisting of a moulding which may include the guard

shoulders integrally therewith. The guard shoulders are preferably provided with suitable metal reinforcement, such as a stainless steel bar extending along and over the crest of each shoulder. Such reinforcement may be particularly desirable if non-rolling components of vehicles, such as snow-plough blades, are likely to be moving along close to the surface of a road in which the markers are installed.

In another of its aspects the present invention provides a road marker of the kind hereinbefore specified, in which the exposed light-receiving or light-transmitting surface or surfaces are inclined at a low angle to the horizontal. Preferably, the mounting means of such a road marker is of the kind consisting of a ball of synthetic rubber or other suitable resilient material, the reflector unit resting on the ball. The upstanding portion of the reflector unit is preferably made so that the said surfaces define a pair of opposed ramps, sloping at both front and back in the direction of travel of a vehicle over the marker, the horizontal length of each ramp being substantially greater than that of the exposed upper surface, if any, joining the ramps at the peak of the upstanding portion. This arrangement enables a vehicle tyre to rise gradually over the movable reflector unit rather than imposing a sudden impact on the upstanding portion as is the case with the "tombstone" type of marker. It will be seen that the reflector unit having

sloping reflector surfaces is depressed by a vehicle tyre with initially small and temporarily increasing velocity, which is better both for the vehicle and for the road marker in terms of the magnitude of the forces applied.

5           In addition, a gently-sloping, ramp-like portion of a depressible reflector unit presents a considerably reduced hazard to light vehicles, particularly bicycles and motor cycles, and also to pedestrians and horses, as compared with a reflector unit having vertical exposed  
10 surfaces facing the oncoming traffic.

Where the exposed light-receiving and light-transmitting surfaces of the reflector are inclined to the horizontal, they will be contacted by vehicle tyres. They are also well exposed to rain, and will be washed by  
15 the rain; but in dry weather, or at other times when there is not heavy rain (or even when there is) it is necessary to provide for cleaning of these surfaces, since they are exposed to mud, oil and other dirt, some of which is of a particularly tenacious nature.

20           It is known to clean sloping surfaces of non-depressible reflectors of road markers by means of wiping contact with the vehicle tyre. The present invention provides, as a further feature of the invention, a road marker of the kind hereinbefore specified in which the  
25 exposed light-receiving and light-transmitting surfaces are inclined to the horizontal, the depressible reflector unit having in a generally-upwardly facing surface thereof

at least one aperture communicating with the interior of the outer casing. The reflector unit is a close sliding fit in the outer casing, the inside of which is in communication with the atmosphere through only the aperture (or apertures) in the reflector unit, so that when the reflector unit is depressed, fluid, consisting of air and/or water, contained in the outer casing will be ejected to atmosphere under pressure.. The or each aperture is so arranged that this fluid can be directed on to the exposed light-receiving and light-transmitting surfaces, so as to assist the cleaning action of the tyre wiping over these surfaces. The apertures may typically be directed straight upwards and located immediately adjacent to the lower edges of the inclined surfaces of the ramps described above, so that they eject jets of air and water which impinge on the tyre and splash off it, partly on to the adjacent inclined surface. In the case of the surface which slopes downwardly in the direction of travel of the vehicle, the rolling tyre will tend to carry this water on to that surface.

In a further aspect, the invention provides a road stud of the kind hereinbefore specified wherein the or each reflective surface is formed on one side of a reflector element whose opposite side is exposed to atmosphere, the reflector unit comprising a body member and one or more of these reflector elements sealed directly or indirectly on the exterior of the body member, so that



the or each reflective surface is not exposed to the atmosphere, the resilient mounting means consisting of a ball of synthetic rubber or other suitable resilient material, and the reflector unit being supported on the  
5 ball. By contrast with the arrangement described and illustrated in the said Patent Specification No. 1507385, in which the body member envelops the reflector elements and therefore has itself to be made of translucent material, the reflector unit body member in a road stud  
10 according to this aspect of the present invention can be of any material chosen for its impact resistance and/or other properties, and this choice need not be limited by any need for translucency.

The reflective surfaces of road markers made  
15 according to this invention are preferably of the conventional corner-cube type as in the road markers described in the said patent specification. The facets of each reflective surface are so shaped and orientated, having regard to the angle defined between the reflector  
20 and the horizontal, that the amount of light from the lights of an oncoming vehicle, directed back to the driver of the vehicle by the reflectors, is as nearly as practicable the maximum theoretically possible, this light being directed back in a divergent beam subtending the  
25 widest achievable angles in both horizontal and vertical planes. Design of corner-cube reflectors to achieve particular results is a technique well known in the art.

As mentioned earlier herein, the reflective surfaces are preferably formed on reflector elements which, in preferred embodiments of the invention, are mounted externally on the body of the reflector unit of the road marker. These elements are most typically flat, though they might for certain particular applications be suitably curved. The elements are so mounted that there is an enclosed air space behind each reflective surface. As in the road markers discussed in the said patent specification, the preferred arrangement involves paired reflectors, i.e. reflectors having their reflective surfaces arranged to deflect light in opposite directions (i.e. in two opposed, divergent beams) so as to be visible to vehicles travelling in either direction. It will be further appreciated however that the reflective surface or surfaces may be so arranged, and be of such a number and/or shape, that light is reflected in more than these two directions, and may for example even be arranged to reflect light incident on the reflective surfaces from any direction around the marker.

One typical road marker, incorporating the various features of the invention in all its above-mentioned aspects, will now be described, by way of example only and with reference to the accompanying drawings, in which:

Figure 1 is a plan view of the marker;

Figure 2 is a cross-sectional elevation taken on the line II-II in Figure 1;

Figure 3 is a part-sectional elevation of the reflector unit only, taken on the line III-III in Figure 1;

Figure 4 is an enlarged scrap section, taken on the line IV-IV in Figure 1 and illustrating the cleaning of an exposed light-receiving and light-transmitting surface of the road marker; and

Figure 5 is a partly cut-away perspective view illustrating the mounting of reflective elements and adjacent components of the reflector unit.

Referring to Figures 1 to 3, the road marker comprises an outer casing 10, a reflector unit 11, and a resilient ball "spring" 12, made of synthetic rubber and supporting the reflector unit 11 in the outer casing 10. The reflector unit 11 has an upstanding portion 13 (which will for convenience be called the "lantern") furnished with a pair of reflectors 14, each having a reflective surface in the form of a pair of reflective panels 15 arranged side by side as shown in Figure 1.

The outer casing 10 consists of a generally cylindrical barrel 16 having a flat upper surface 17 and, at its upper end, an outwardly directed frusto-conical flange 18, and a circular bottom end cap 19, thickened in the centre as shown at 20. The end cap 19 has a peripheral, upstanding cylindrical portion 21 which is secured, preferably by a known spin welding technique, to the bottom portion of the outer casing barrel 16.

The road marker is arranged to be embedded in a cylindrical hole (indicated by phantom lines at 22 in Figure 2), formed by means of a suitable drill in a roadway the level of whose surface is indicated at 23.

5 The spaces 24 in the hole 22 around the outer casing of the road marker are filled with a suitable water-resistant compound which retains the marker firmly in position.

The main component of the reflector unit 11 consists of a body member 25, which has a generally-cylindrical  
10 outer skirt 26 provided with four equally-spaced vertically-extending radial ribs 27, which terminate at their lower ends in an outwardly-facing, circumferential stop shoulder 28 also forming part of said skirt. The cylindrical outer surfaces of the skirt 26 are a close  
15 sliding fit in the bore of the cylindrical barrel 16 of the outer casing, whilst the radial ribs 27 fit slidably in corresponding radial grooves 29 formed in the bore of the barrel 16. The grooves 29 terminate at their lower ends in a downwardly-facing stop shoulder 30, so that, as  
20 shown in Figure 2 in full lines, the stop shoulders 28, 30 abut against each other when the reflector unit is in its normal or upper position, in which a flat upper surface 31 of the reflector unit body lies flush with the flat upper surface 17 of the outer casing. In this normal position  
25 the whole of the lantern 13 lies, of course, above the surface 23 of the road.

Like the barrel 16 and end cap 19 of the outer

casing, the reflector unit body 25 is preferably injection-moulded in a single piece from a suitable synthetic plastics material having a high impact resistance. A preferred material is polycarbonate.

5           The body 25 has an upper portion 32 from which the outer skirt 26 depends, and which has no openings through it other than four small slots 33, the purpose of which will be described hereinafter. Depending from the upper portion 32 is an inner skirt 34, coaxial with  
10 the outer skirt 26 and joined to it by integral radial ribs 35. Rigid, load-bearing ribs 36 are provided integrally within the inner skirt 34, the whole construction of the body 25 being such that it is extremely rigid in all directions.

15           The ball spring 12 bears at the top upon an insert disc 37 which lies flat against the lower edges of the load-bearing ribs 36, and at the bottom against the thickened portion 20 of the outer casing end cap 19, which is preferably provided with a coaxial, upstanding  
20 guard wall 38 within which the ball is compressed when the reflector unit is depressed.

Referring now to Figure 5 as well as to Figures 1 to 3, the lantern 13 is constructed as follows. An insert body 39, secured in the upper portion 32 of the reflector  
25 unit body, has a pair of flat, ramp-like portions 40 inclined in opposite directions, but at equal angles, to the horizontal. At each side of the insert body there is

a flank portion 41 comprising a depending curved outer wall portion and straight inner wall portion. Projecting from the lower edge of each of the ramp-like portions 40 is a lug 42. A guard bar 43, of steel which is preferably stainless steel, rests in a shallow groove formed on the curved crest of each of the flank portions 41. The guard bars are hooked under the insert body 39 as indicated at 44 in Figure 5. The reflector unit body 25 is made by moulding it around the insert body 39, so that the lugs 42 and flank portions 41 of the latter are embedded firmly in the body 25, as seen in Figures 2 and 3 respectively. As can also be seen from Figure 3, the flank portions 41 form the cores of two lateral guard shoulders 45, which flank the ramp-like portions 40 and which are reinforced by the guard bars 43. The guard bars are preferably exposed at the top, along the greater part of their length, but without protruding significantly above the shoulders 45. The underside of the insert body 39 is preferably strengthened by means of integral ribs such as the longitudinal ribs 46, embedded into strengthening ribs 47 of the reflector unit body 25.

Each of the two reflectors 14 is in the form of a flat element whose rear or reflective surface 48 is of the conventional "corner-cube" type. The front, light-transmitting and light-receiving surface 49 is smooth and flat. The reflectors 14 are fixed indirectly to the exterior of the reflector unit body 25 by being secured

to the insert body 39. As is shown in Figure 2, each reflector lies over, and parallel to, the corresponding ramp-like portions 40 of the insert body, the reflector having a peripheral spacing bead 50 lying upon the surface 40, so that there is an enclosed (i.e. sealed) air gap 51 immediately behind the reflective surface 48. Each reflector 14 is secured around its entire periphery to the insert body 39 and shoulders 45 by ultrasonic welding. Its lower edge is located against and welded to, a lip 52 of the insert body, and its upper edge against an upstanding ridge 53 of the insert body, joining the two ramp-like portions 40. The upper edge of each reflector 14 preferably has spacing beads 54 (Figure 1) to ensure accurate location of the reflector in the insert body. During the welding process the gap between the reflector and the ridge 53, determined by these spacing beads, is filled with a fillet 55 of synthetic plastics material.

In the completed reflector unit 11, the reflectors are thus sealed to the remainder of the reflector unit, and define a pair of ramps, inclined to the horizontal and separated by the ridge 53, whose substantially flat upper surface 56 has a horizontal length (measured along the line II-II in Figure 1) very much smaller than that of either of the two reflectors themselves. The ridge 53 is in fact optional: the two reflectors may alternatively be arranged in back-to-back contact, their upper edges being welded directly together. Alternatively, the reflectors

may be made integrally with each other, i.e. moulded as a single piece.

Mention has already been made of the four slots 33, two of which are located in the flat upper surface 31 of the reflector unit body immediately adjacent to the lower edge of each of the reflectors 14. One of the slots is shown in Figure 4, from which it can be seen that the entry to the slot is relieved as shown at 57.

In operation of the road marker shown in the drawings and described above, the appropriate reflective surface 48 reflects light, received from the lights of a vehicle approaching the marker, back towards the driver of the vehicles. To this end, the facets of the surface 48 are so shaped and orientated as to direct this light in a divergent beam of wide angle as previously discussed herein. When a vehicle wheel runs over the road marker, its tyre (indicated diagrammatically at 58 in Figure 4) rides over the guard shoulders 45 and also rolls upon the inclined outer surfaces 49, 56 of the lantern 13. This causes the reflector unit 11 to be depressed against the ball spring 12, to the position indicated by phantom lines 59 in Figure 2. Figure 4 also shows the reflector unit in a depressed position. Because the shoulders 45 and the surfaces 49 are of gradually sloping configurations, the depression of the reflector unit is itself gradual (even though, in practice, it will occur over a small fraction of a second). This helps to minimise both the



shock transmitted to the vehicle, and the shock applied to the marker.

As has been seen, the reflector unit body 25 makes a close sliding fit in the outer casing 10; therefore, as the reflector unit is depressed, air within the outer casing is expelled under considerable pressure through the slots 33. After passage of the tyre over the marker, the ball spring returns the reflector unit to its normal position, at the same time causing air to be sucked into the outer casing 10 through the slots 33. Whenever the road surface is wet, water will be carried into the outer casing with this inflow of air. In addition, rain and other surface water will in any case tend to find its way down through the slots. At most times, therefore, there will tend to be a substantial quantity of water within the hollow outer casing of the marker; so that when the reflector unit is depressed, some of this water is expelled upwardly through each slot 33 in the form of a jet. This jet of water impinges on the tyre 58, which is thus wet as it wipes over the exposed upper surfaces 49 of the reflectors. In this way cleaning of the reflectors is effected.

The relieved entry portion 57 of each slot helps to prevent clogging of the slot and may also assist to direct the jet of water towards the adjacent reflector surface 49.

As can be seen from Figures 2 and 3, the crests

of the shoulders 45, and in particular the highest part  
of the steel guard bars 43, lie slightly above the level  
of the upper surface 56 of the lantern ridge 53. Thus,  
when the reflector unit is fully depressed by a vehicle  
5 wheel, the highest point of each of the shoulders 45 is  
substantially flush with the road surface, and the  
remainder of the reflector unit 11 is below it.

Whereas in the above embodiment the reflector  
unit incorporates two guard shoulders 45, other  
10 embodiments may incorporate a single central guard  
shoulder, or even three or more guard shoulders  
distributed across the width of the reflector unit.

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CLAIMS

1. A reflective road marker comprising -

an outer casing adapted for embedding in a surface layer of a road with an upper rim part of said casing substantially flush with the surface of said road; and

a displaceable reflector unit slidably received in said casing, being supported therein by a resilient supporting means and having parts thereof protruding normally outside said casing above said road surface, said parts including at least one reflective element positioned so as to reflect light received from oncoming vehicles back to said vehicles, and said reflector unit being depressible by a vehicle tyre passing over said protruding parts,

characterised in that said reflector unit is provided with protruding guard means adjacent said protruding parts for reducing the extent or degree of physical contact of said parts with a said vehicle tyre passing over said parts, contact of a said tyre with said guard means acting to depress said reflector unit into said casing and thereby to move said reflective element in a direction away from said tyre.

2. A road marker according to Claim 1, wherein said protruding guard means protrude from said casing further than said reflective element, so that a said tyre contacts said guard means before or instead of

said reflective element.

3. A road marker according to Claim 2, wherein said reflective element is generally planar and is inclined at a relatively low angle to said rim part of said casing in a direction (hereinafter referred to as 'said first direction') generally parallel to that in which light is to be received and reflected when said marker is in use in a road, and

wherein said guard means protrudes above said casing rim part further than adjacent parts of said reflective element at all positions along said element in the said first direction.

4. A road marker according to Claim 3, wherein said reflector unit also includes a second reflective element which is similar to the first-mentioned reflective element and which is similarly disposed on said reflector unit but in a back-to-back relationship with said first-mentioned reflective element so as to receive and reflect light received from a direction opposite to the said first direction, and

wherein said guard means protrudes above said casing rim part further than adjacent parts of a said reflective element at all positions along the respective elements in the said first direction.

5. A road marker according to Claim 4, wherein the distance separating the furthest protruding parts of the respective reflective elements is small compared with

the length of each such element measured parallel to said casing rim part and along said first direction.

6. A road marker according to any one of the Claims 3 to 5, wherein said guard means comprises at least one guard shoulder disposed alongside a part or parts of the or each said reflective element and extending generally parallel to said first direction.

7. A road marker according to Claim 6, wherein said guard means comprises two guard shoulders disposed respectively on opposite sides of the or each said reflective element and extending generally parallel to said first direction.

8. A road marker according to Claim 6 or 7, wherein the or each said shoulder has an arcuate profile as seen in a direction normal to the said first direction and parallel to said casing rim part.

9. A road marker according to any one of the Claims 6 to 8, wherein the or each said shoulder is formed integrally on said reflector unit.

10. A road marker according to Claim 9, wherein said reflector unit is made from a high-impact synthetic plastics material, and each said shoulder incorporates a protective metal reinforcement for protecting such shoulder from damage by non-rotating devices which may be slid over the marker.

11. A road marker according to any preceding claim, wherein said reflector unit is arranged to slide in a

closely-fitting manner in said casing, and is provided adjacent the or each reflective element with a fluid exit aperture whereby on depression of said reflector unit by a vehicle tyre passing thereover air and/or water collected in said casing is ejected through said apertures to provide a cleaning medium for effecting or assisting in cleaning of the exterior surface of the or each reflective element.

12. A road marker according to Claim 3 or any subsequent claim as dependent on Claim 3, wherein said reflector unit comprises a body member carrying the or each said reflective element and the or each said guard shoulder, and wherein each said reflective element has a generally planar outwardly-facing external surface exposed to the atmosphere, and an inwardly-facing internal surface which (a) is spaced from adjacent parts of said body member except at its periphery, (b) is shaped to constitute a reflective surface for receiving and reflecting said light from oncoming vehicles, and (c) is sealed at its periphery to said body member to prevent contamination of said internal reflecting surface.

13. A road marker according to Claim 12, wherein said body member incorporates a pre-formed assembly comprising a support member on to which is sealed the or each said reflective element.

14. A road marker according to Claim 13, wherein said support member has integrally formed therewith

support means for the or each said guard shoulder.

15. A road marker according to Claim 14, wherein said pre-formed assembly carries on the or each said shoulder support means a metal reinforcement member for the associated guard shoulder.

16. A road marker according to any one of the Claims 13 to 15, wherein said body member is formed by moulding a synthetic plastics material around said pre-formed assembly.

17. A road marker according to Claim 16, wherein said pre-formed assembly is of a synthetic plastics material.

18. A road marker according to any one of the Claims 1 to 17, wherein the said resilient supporting means comprises a sphere of a resilient material trapped between a base member of said casing and the said reflector unit.

19. A road marker according to any one of the preceding claims, substantially as hereinbefore described with reference to, and as illustrated by the Figures 1 to 5 of the accompanying drawings.

20. A road marker according to any one of the Claims 1 to 18, including a resiliently displaceable reflector unit which is substantially as hereinbefore described with reference to, and as illustrated by the Figures 1 to 5 of the accompanying drawings.

FIG. 1

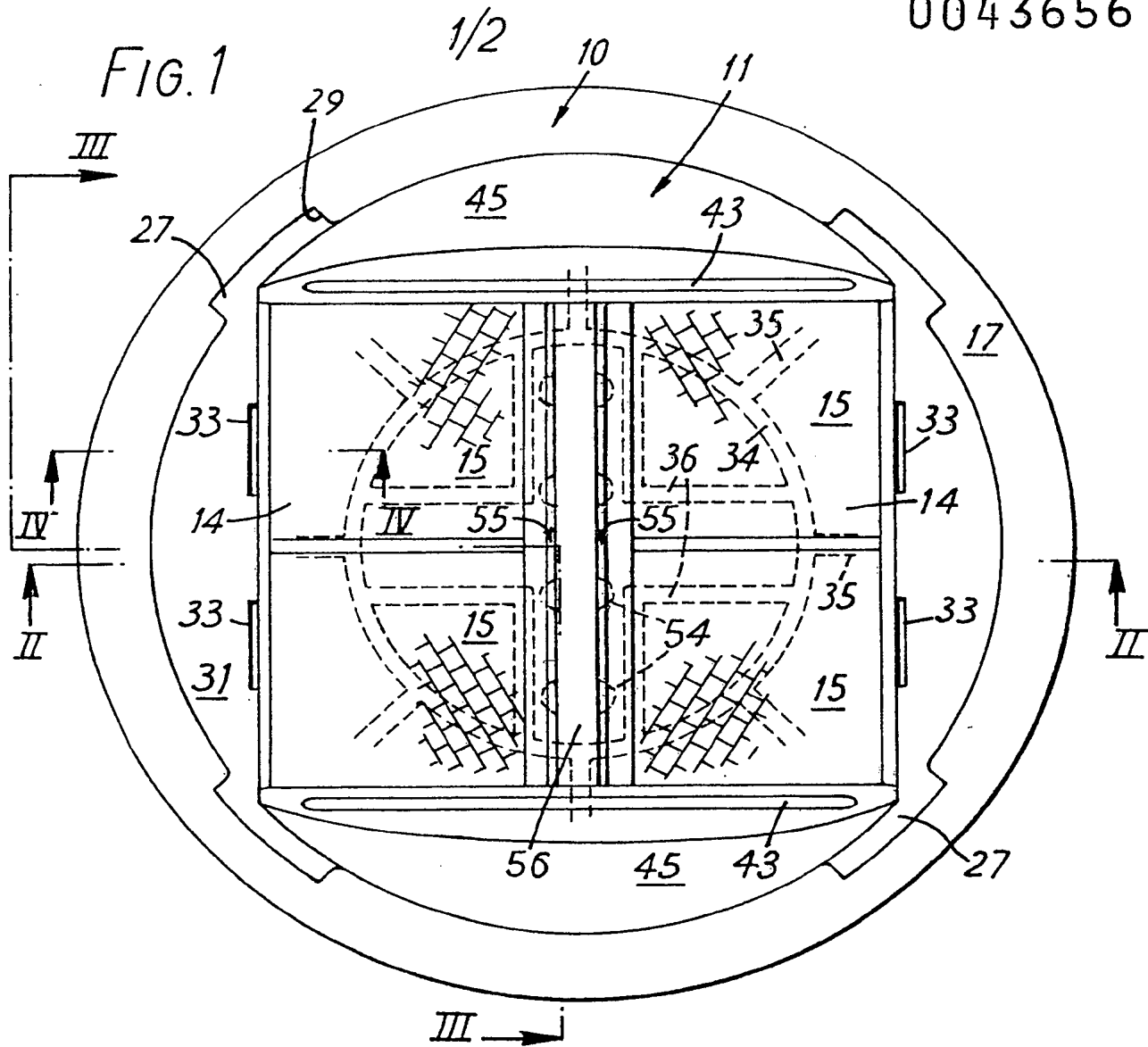


FIG. 4

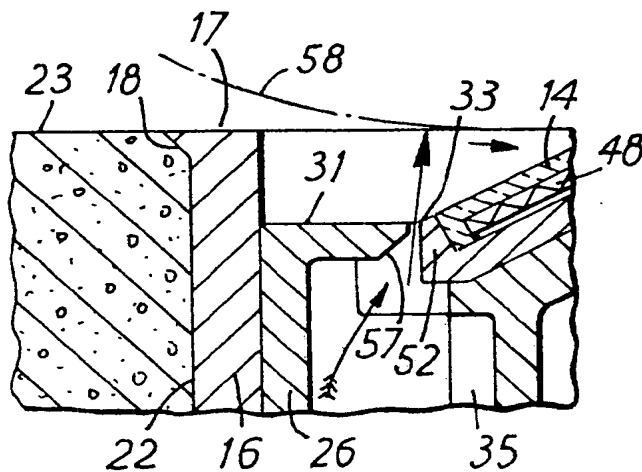


FIG. 5

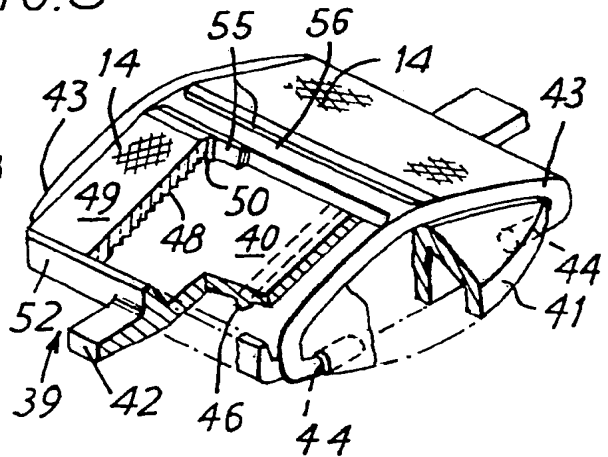




FIG. 2

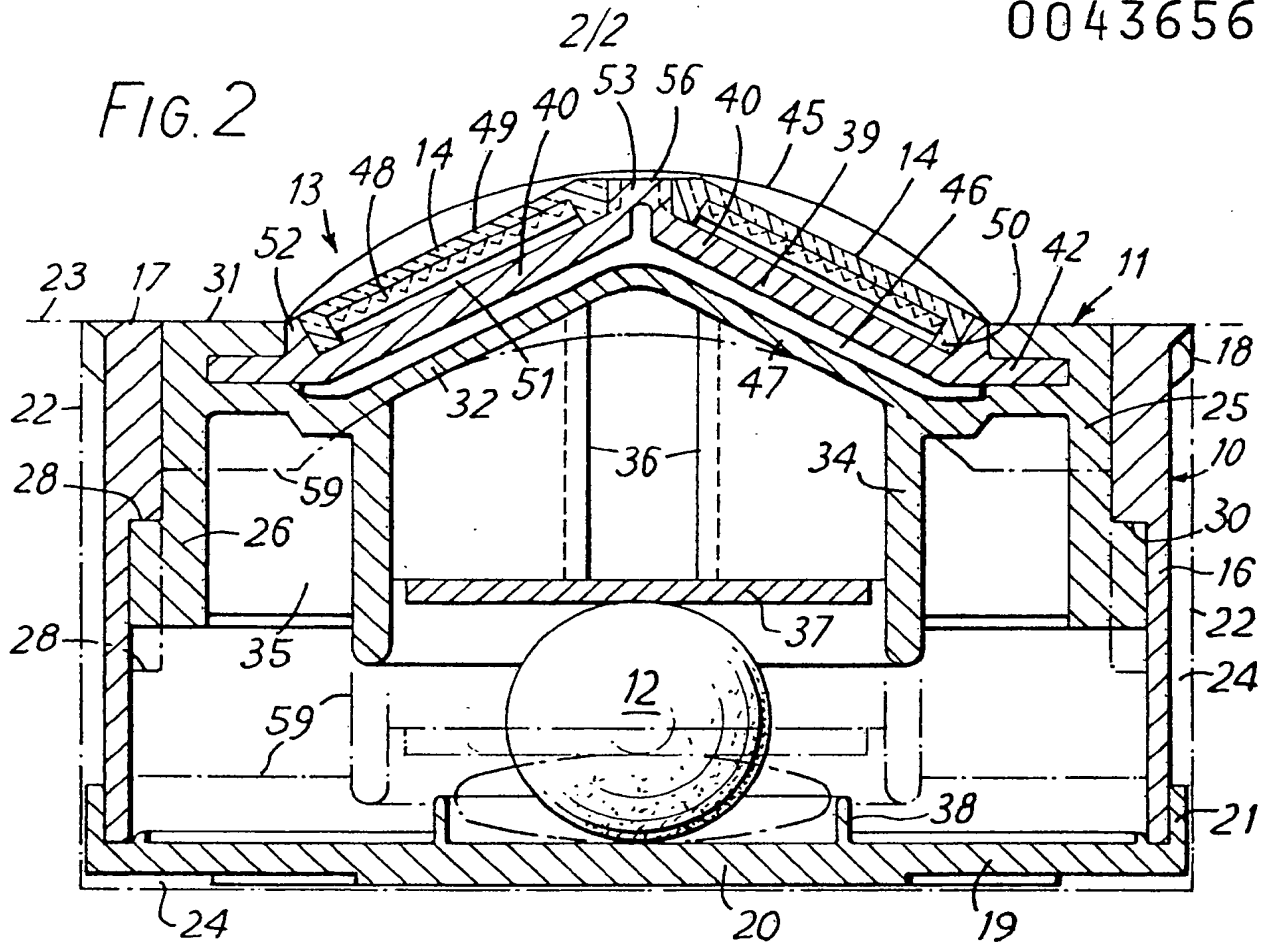
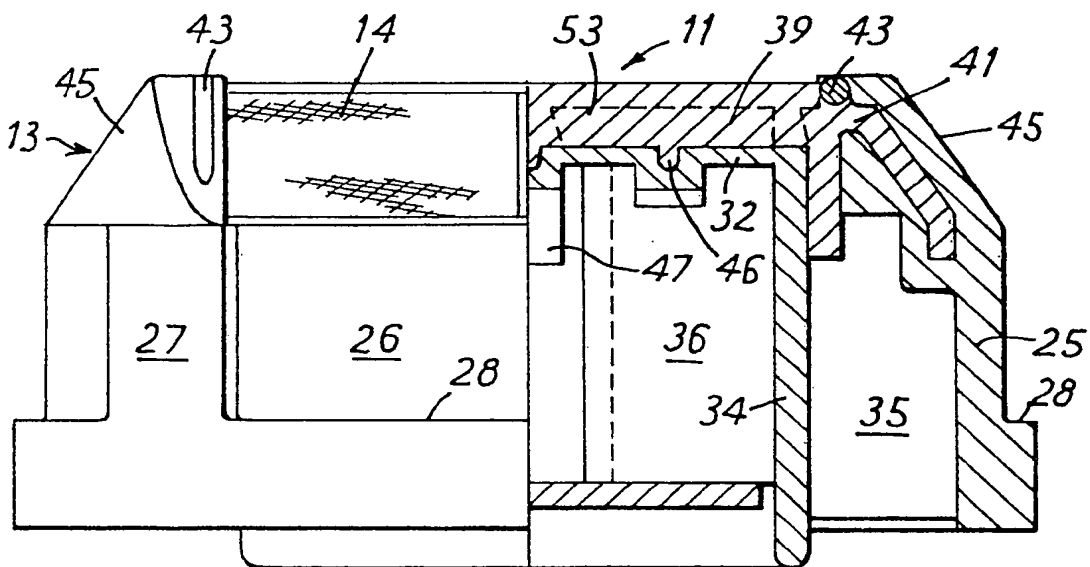


FIG. 3





European Patent  
Office

# EUROPEAN SEARCH REPORT

0043656  
Application number

EP 81 30 2637.4

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 7)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	<u>DE - U - 6 803 854</u> (H. DEBUSCHEWITZ) * page 2, last paragraph to page 3 *	1,2	E 01 F 9/06
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X	<u>GB - A - 903 938</u> (ABBOTT, SR.) * page 2, lines 32 to 128 *	1,2	
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D	<u>GB - A - 1 507 385</u> (MENDEL KING & RAY LTD.) * page 3, lines 1 to 28; fig. 3, 4 *	11,18	
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	<u>GB - A - 1 190 258</u> (BEVERLEY) * complete document *	11	
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	<u>DE - A - 1 941 483</u> (MACRAE) * complete document *	11	
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	<u>US - A - 3 570 377</u> (GERBER) * complete document *	11	
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A	<u>DE - A - 1 784 201</u> (AMERACE ESNA) ./..		
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<input checked="" type="checkbox"/> The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl. 7)  E 01 F 9/00
			CATEGORY OF CITED DOCUMENTS  X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
Place of search	Date of completion of the search	Examiner	
Berlin	29-09-1981	PAETZEL	



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DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	<u>DE - B - 1 784 198</u> (AMERACE ESNA) --		
A	<u>DE - U - 7 143 491</u> (KAMPFL) --		
A	<u>US - A - 3 216 335</u> (G. STOLARCZYK et al.) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.3)